A Method for Subdividing Clinical Guidelines into Process Modules with Associated Triggers and Objectives to Facilitate Implementation

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Representation of multi-step clinical guidelines (CG) and their implementation in computerized decision support (DS) systems are complex and logistically challenging tasks. However, many simple rules based on CGs (e.g., medical logic modules), have been successfully implemented through a few popular DS models (e.g., prevention reminders, order entry systems). To facilitate mapping of CGs to practical DS models, we propose an empirical method for subdividing CGs into modules according to the locus in a clinical process flow model where implementation would be most effective (e.g., post-encounter provider order entry). We further propose a classification of triggers and objectives for CG modules that provides a framework for a DS system to implement the module Successful application of the method to ten diverse CGs in the outpatient setting is described.

INTRODUCTION

Several models for representing the content of CGs have been developed, but none has yet proved adequately flexible and robust to effectively represent the highly variable and complex content of typical CGs for implementation in today's complex medical practice environments. Arden Syntax has facilitated the implementation of simple rules in a standard representation, but has limitations in representing multipart processes (2). More complete knowledge representation schemas such as GLIF (1) provide for more complex logic but do not adequately represent the parts of a clinical information system and the locations in the clinical process flow that offer the best opportunities for effective CG implementation. Given that successful DS systems often apply parts of CGs at specific points in the clinical process flow (3), we hypothesize that subdividing CG content and including process flow parameters in CG representation may facilitate implementation of CGs.

METHODOLOGY

We propose an approach to CG representation that subdivides a CG empirically into modules related to specific points in a clinical process flow model. In contrast to a typical spatial/temporal workflow model, which focuses on physical work logistics, a clinical process flow model focuses on interactions of providers and staff with patients and their data. To facilitate implementation of the modules and the representation of the necessary logic, we propose a classification of triggers and objectives for the modules. Our model for process flow in an ambulatory encounter includes six possible loci for interaction with a CG module: 1) registration, 2) incoming secondary provider interaction, 3) primary provider interaction, 4) outgoing secondary provider interaction, 5) outprocessing, and 6) post-encounter data interactions CG module triggers were classified as: 1) Automatic/Immediate (order entry, administrative data entry, clinical data entry, test result posting, test result review), 2) Automatic/Delayed (prevalent condition, elapsed time) and 3) Operator module selection (module selected from menu). Objectives include four subclasses: 1) output medium (e.g. screen, paper), 2) output format (e.g., text, algorithm), 3) target (e.g., provider, patient), and 4) output content (e.g., data presentation and interpretation, critique of action, recommended action).

RESULTS AND DISCUSSION

We subdivided ten diverse CGs from the Institute for Clinical Systems Improvement CG library (http://www.icsi.org/knowledge/) into modules linked to outpatient process flow loci, and then identified relevant trigger types and objective classes. For all content of the CGs the modules and related process flow loci were readily identified and consensus on subdivision was achieved for three independent coders. The proposed methodology appears to be a practical means of representing several important aspects of CGs and may help facilitate the implementation of CGs in clinical information systems.

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